49. (New) The method of claim 46, wherein the exposing the carbon containing layer to a plasma comprises flowing the inert gas into a processing chamber at a rate of about 100 to about 4000 sccm, establishing a chamber pressure between about 1 Torr to about 12 Torr and applying an RF power density of from about 0.7 to about 11 W/in^2.

C3 cont'd

REMARKS

This is intended as a full and complete response to the Office Action dated March 15, 2002, having a shortened statutory period for response set to expire on June 15, 2002. Claims 24-26, 28, 30-38, 40, and 42-45 are pending in the application. Claims 24-26, 28, 30-38, 40, and 42-45 were considered by the Examiner and stand rejected. Applicants have added new claims 46-49 to recite additional aspects of the invention. In addition, Applicants have amended claims 30-34 and 42-45 to more clearly recite aspects of the invention.

Claims 34-36, 38, 42-43, and 45 stand rejected under 35 U.S.C. § 112, second paragraph. The Examiner takes the position that the meaning of "step for depositing" for the first layer is of unclear scope. Applicants have amended the claims to remove the reference to a "step for" depositing the carbon containing layer. The carbon-containing layer may be deposited by methods known to one skilled in the art. In addition, Applicants have added new claims 46-49 to recite a method for treating a carbon-containing layer. Therefore, Applicants respectfully request withdrawal of the rejection.

Claims 33 and 45 stand rejected under 35 U.S.C. § 112, first paragraph. The Examiner takes the position that there is no evidence or suggestion in the specification that inert gas plasma treatment of organic polymers will have no composition changes caused by the plasma treatments. Applicants have amended claims 33 and 45 and respectfully submit that the specification provides support for amended claims 33 and 45 on pages 6 and 7. The results recited on page 7 confirm that a plasma consisting essentially of an inert gas does not significantly affect the composition of the silicon containing layers. As such, Applicants respectfully request withdrawal of the rejection of claims 33 and 45, which recite a material comprising SiC or SiCOH, as amended.

Claims 24, 26-27, 30-36, 38, 42, and 45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,549,935 (*Nguyen, et al.*) in view of German Patent No. 196 54 737 A1 (*Itoh, et al.*). The Examiner has taken the position that the combination of *Nguyen, et al.* and *Itoh, et al.* teaches each element recited in the rejected claims. Applicants traverse the rejection and respectfully submit that the cited combination of references fails to teach, show, or suggest each of the limitations recited in Applicants' claims.

Nguyen, et al. teaches that in order to enhance the adhesion between a substrate and a subsequently applied polymeric fluorocarbon film, an interlayer of silicon and/or a silicide is provided. (*See*, column 2, lines 30-33). *Nguyen, et al.* does not teach or suggest treating a film with a plasma consisting essentially of an inert gas to enhance adhesion. Rather, *Nguyen, et al.* teaches etching a silicon oxide or a silicon nitride with a plasma, such as argon, to remove the oxygen or nitrogen and form a silicon adhesion layer. (*See*, column 2, line 58 – column 3, line 5). In addition, *Itoh, et al.* teaches depositing a silicon dioxide intermediate layer 202. *Itoh, et al.* then teaches depositing a copper film 203 on the silicon dioxide film 202 and subsequently depositing a layer containing silicon, oxygen, carbon, and hydrogen 204 on the copper film 203. (*See*, pages 2 and 18 and Figures 3A and 3B). *Itoh, et al.* nowhere teaches or suggests treating the silicon, oxygen, carbon, and hydrogen film 204. As a result, neither *Nguyen, et al.* nor *Itoh, et al.*, alone nor in combination, teach or suggest depositing a first layer on the semiconductor substrate, the first layer comprising a material selected from the group consisting of organic polymeric materials, αC, αFC, SiCOH, and SiC, and exposing the first layer to a plasma consisting essentially of an inert gas, or treating the first layer with a plasma consisting essentially of an inert gas as recited in claims 24 or 34. As such, reconsideration of the rejection is respectfully requested.

Claims 24, 26, 33-34, 36, 38, and 45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,004,631 (*Mori*). The Examiner takes the position that *Mori* teaches a process including coating an organic polymer or a spin-on-glass layer of silicon oxide that may contain hydrocarbon residues, and therefore is composed of Si, C, O, and H, and treating the coating with a plasma of an inert gas. Applicants traverse the rejection of claims 24, 26, 33-34, 36, 38, and 45 and respectfully submit that *Mori* fails to teach, show, or suggest each of the limitations recited in Applicants' claims.

Mori teaches that coatings may include silicon oxide, which is a typical material of a spin-on-glass film, and may contain carbon. *Mori* further teaches initiating a helium plasma and then adding a fluorocarbon gas plus oxygen to remove the outer portion of the spin-on-glass film when carbon is present. (*See*, column 11 and column 13, lines 1-4). As a result, the spin on glass exposed to helium is totally removed by the fluorocarbon gas and the oxygen. Therefore, the spin on glass is not treated to improve adhesion and does not have a second layer deposited thereon. As such, reconsideration and withdrawal of the rejection is respectfully requested.

Claims 24-26, 28, 30-38, 40, and 42-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Nguyen, et al.* in view of U.S. Patent No. 5,964,942 (*Tanabe, et al.*). The Examiner takes the position that *Tanabe, et al.* teaches the limitation missing in *Nguyen, et al.* of depositing SiC as an intermediate layer on semiconductor substrates, prior to the deposition of a carbonaceous layer of diamond. The Examiner further states that diamond related deposits, unless doped, are generally insulating and that SiC is desirable for the adhesion of subsequent carbon based coatings. Applicants traverse the rejection and respectfully submit that the cited combination of references fails to teach, show, or suggest each of the limitations recited in Applicants' claims. Neither reference teaches or suggests treating a carbon containing film with a plasma consisting essentially of an inert gas. Therefore, it would not have been obvious to combine the teachings of *Tanabe, et al.* with *Nguyen, et al.*

In conclusion, the references cited by the Examiner, neither alone nor in combination, teach, show, or suggest the method or process of the present invention, specifically, the references do not teach a single layer comprising a material selected from the group consisting of organic polymeric materials, αC, αFC, SiCOH, and SiC for improved adhesion and oxidation resistance by exposing the first layer to a plasma consisting essentially of an inert gas. Having addressed all issues set out in the office action, applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

The prior art made of record is noted. However, it is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the office action. Therefore, it is believed that a detailed discussion of the secondary references is not deemed necessary for a full and

complete response to this office action. Accordingly, allowance of the claims is respectfully requested.

Respectfully submitted,

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APPENDIX:

IN THE CLAIMS:

30. (Amended) The method of claim 24, wherein the exposing the first layer to the plasma comprises [generating the plasma by] flowing the inert gas into a processing chamber at a rate of about 100 to about 4000 sccm, establishing a chamber pressure between about 1 to about 12 Torr, and applying RF power to an electrode of the processing chamber to provide a power density of about 0.7 to about 11 W/in^2.

31. (Amended) The method of claim 24, wherein the exposing the first layer to the plasma is performed in the same processing chamber as [and] the depositing the first layer [are performed in a single process chamber].

32. (Amended) The method of claim 25, wherein the exposing the first layer to the plasma is performed in the same processing chamber as [and] the depositing the first layer [are performed in a single process chamber].

33. (Amended) The method of claim [24] 26, wherein the first layer comprises silicon carbide and the exposing the first layer to [the] a plasma does not substantially change a composition of the first layer as detected by a fourier transform infrared analysis.

34. (Amended) A method of processing a semiconductor substrate, comprising:

[step for] depositing a first layer on a semiconductor substrate, the first layer comprising a material selected from the group consisting of [organic polymeric materials, αC, αFC,] SiCOH[,] and SiC;

treating the first layer with a plasma consisting essentially of an inert gas; and

depositing a second layer over the first layer.

42. (Amended) The method of claim 34, wherein the treating the first layer comprises exposing the first layer to [the] plasma generated by flowing [the] inert gas into a processing chamber at a rate of about 100 to about 4000 sccm,

establishing a chamber pressure between about 1 to about 12 Torr, <u>and</u> applying RF power to an electrode of the chamber to provide a power density of about 0.7 to about 11 W/in^2.

43. (Amended) The method of claim 34, wherein the treating the first layer and the [step for] depositing the first layer are performed in a single process chamber.

44. (Amended) The method of claim 37, wherein the treating the first layer and the [step for] depositing the first layer are performed in a single process chamber.

45. (Amended) The method of claim 34, wherein the treating <u>the first layer</u> [step] does not substantially change [the] <u>a</u> composition of the first layer.